REMARKS

In the Office Action the Examiner noted that claims 1-7 were pending in the application and the Examiner rejected all claims. By this Amendment, various claims have been amended and new claim 8 has been added. Thus, claims 1-8 are pending in the application. The Examiner's rejections are traversed below.

Drawing Objections

Substitute Drawings for Figures 2 and 3 are being submitted herewith to designate these figures as "prior art".

With respect to the Examiner's rejection in item 2 on pages 2 and 3 of the Office Action, new drawing Figures (Figures 4 and 5) are being submitted to correspond to original claims 2 and 3 as filed and are therefore fully supported by the original application (also, see page 9 of the application). Specifically, these claims specify options where the motor control part 4 of Figure 1 is placed in one of the motor amplifiers or in the amplifier power supply. Therefore, it is submitted that the objection under 37 C.F.R. § 1.83(a) should be overcome.

The Prior Art Rejection

In item 4 on pages 3 and 4 of the Office Action the Examiner rejected claims 1-7 as unpatentable over U.S. Patent 5,502,554 to Carolan in view of prior art Figure 2 in the applicant's application.

The Examiner takes the position that Carolan discloses all of the features of the claims except for the feature where the "numerical control port is integrally placed with display and motor control part and amplifier are placed on a power panel and motor control part incorporated into amplifier" (page 3 of Office Action). However, the Examiner takes the position that these features are taught by Figure 2 of the subject application and the Examiner further takes the position that:

> It would have been obvious to one of ordinary skill in the art to combine the numerical control apparatus of Carolan with the panel and incorporation of Fig. 2 for improved control.

(Page 4 of Office Action.)

The Present Claimed Invention

As explained on pages 3 and 4 of the subject application, the arrangement of prior art Figure 2 has a drawback in that a cooperative control of the motors is difficult since the motor control parts 41-1 to 41-4 are distributed. Further, expensive optical interfaces must be provided for the motor amplifiers 5-1 to 5-4 because the numerical control part 1 and the motor amplifiers are connected by an optical fiber cable 11.

The present claimed invention seeks to overcome deficiencies of the prior art by providing an inexpensive numerical control apparatus which facilitates cooperative control between motors and enables the continuation of control even when the numerical control part falls into an abnormal condition. To do this, the motor control part and the plurality of motor amplifiers are placed on a power panel. The motor control part controls all of the plurality of motors so as to provide cooperative control between the motors and continuation of control even when the numerical control part falls into an abnormal condition. Further, the motor control part and the plurality of motor amplifiers are connected by either an electric cable or a serial communication line.

The Prior Art

U.S. Patent 5,502,544 to Carolan is directed to an imaging machine which is provided having a control and movable components including a photosensitive member and copy sheet transports. The control includes a main controller and a servo system interconnected over a serial command bus, and the servo system is electrically connected to a given movable component and provided with a control profile for directing the movement of the given movable component (see Abstract).

Referring to Figure 3 which is relied upon by the Examiner, a block diagram of a servo control system is disclosed. A master controller 68 communicates with dual servo controllers 72, 74 and 76 over a common serial command bus 70. Each dual servo controller includes RAM and ROM and controls the operation of a pair of motors. For example, dual servo controller 72 is connected to DC motor 73A through amplifier 72A, and to DC motor 73B through power amplifier 72B.

The Present Claimed Invention Patentably Distinguishes Over the Prior Art

While the dual servo controllers disclosed in Figure 3 of Carolan are used to control two DC motors, there is no teaching or suggestion in the prior art of a numerical control apparatus in which:

> a numerical control part integrally placed with a display and outputting a move command:
>
> a motor control part generating a PWM signal for a plurality of motors based on the move command from the numerical control part; and
>
> a plurality of motor amplifiers, each driving a respective one of said plurality of motors based on the PWM signal from the motor control part, wherein
>
> said motor control part is configured so as to control all of the plurality of motors with a single motor control part, and said motor control part and said plurality of motor amplifiers are placed on a power panel; and
>
> said numerical control part and said motor control part are connected by a serial communication line.

As set forth in claim 1, specifically, none of the prior art teaches or suggest a motor control part configured to control all of the plurality of motors with a single motor control part, wherein the motor control part and the plurality of motor amplifiers are placed on a power panel. Therefore, it is submitted that claim1 patentably distinguishes over the prior art.

In addition, it is submitted that the Examiner's line of reasoning for combining the features of Figure 2 and Carolan is inappropriate. Specifically, the Examiner states that one of skill could have been lead to combine the features of these two items of prior art "for improved control". Applicants are unable to locate anything in the prior art that would have suggested the combination of these features. It is submitted that only through the improper use of the applicant's application as a blueprint would one of ordinary skill have been lead to combine the

teachings of these documents. Therefore, it is submitted that the combination of Carolan and prior art Figure 2 should be withdrawn.

For the above reasons, it is submitted that claim 1 patentably distinguishes over the prior art.

Referring to claim 2, it is submitted that the prior art does not teach or suggest:

> a numerical control part integrally placed with a display and outputting a move command;
>
> a motor control part generating a PWM signal for a plurality of motors based on the move command from the numerical control part; and
>
> a plurality of motor amplifiers, each driving a respective one of said plurality of motors based on the PWM signal from the motor control part, wherein:
>
> said motor control part is configured so as to control all of the plurality of motors with a single motor control part, and said motor control part and said plurality of motor amplifiers are placed on a power panel;
>
> said motor control part is incorporated into one of said plurality of motor amplifiers; and
>
> said numerical control part and said motor control part are connected by a serial communication line.

Therefore, it is submitted that claim 2 patentably distinguishes over the prior art.

Referring to claim 3, it is submitted that the prior art does not teach or suggest the claimed numerical control apparatus which includes:

> a numerical control part integrally placed with a display and outputting a move command;

a motor control part generating a PWM signal for a plurality of motors based on the move command from the numerical control part; and

a plurality of motor amplifiers, each driving a respective one of said motors based on the PWM signal from the motor control part, wherein:

said motor control part is incorporated into an amplifier power supply, and said motor control part is placed on a power panel along with said plurality of motor amplifiers; and

said numerical control part and said motor control part are connected through a serial communication line.

Therefore, it is submitted that claim 3 patentably distinguishes over the prior art.

Claims 4 and 5 depend from claims 1, 2 and 3 and include all of the features of the claims from which they depend, plus additional features which are not taught or suggested by the prior art Therefore, it is submitted that claims 4 and 5 patentably distinguish over the prior art.

Referring to claim 6, it is submitted that the prior art does not teach the claimed numerical control apparatus which includes:

a numerical control part outputting a move command,
a plurality of motor amplifiers respectively driving a plurality of motors, and

a motor control part generating a motor drive signal to be sent to said plurality of motor amplifiers based on the move command from said numerical control part, wherein

said motor control part is located outside said numerical control part, and communications between said numerical control part

and said motor control part, and between said motor control part and said plurality of motor amplifiers are carried out over a communication path.

Therefore, it is submitted that claim 6 patentably distinguishes over the prior art.

Referring to claim 7, it is submitted that the prior art does not teach or suggest the claimed numerical control apparatus which includes:

a numerical control part outputting a move command;

a plurality of motor amplifiers belonging to a first group and driving a first plurality of motors;

one or more motor amplifiers belonging to a second group;

a first motor control part generating a motor drive signal to be sent to said plurality of motor amplifiers belonging to the first group based on the move command from said numerical control part; and

a second motor control part generating a motor drive signal to be sent to said one or more motor amplifiers belonging to the second group, wherein

said first and second motor control parts are placed outside said numerical control part respectively and are linked to said numerical control part in a daisy chain mode through a serial communication path.

Therefore, it is submitted that claim 7 patentably distinguishes over the prior art.

New Claim 8

New claim 8 is directed to a numerical controller apparatus which includes:

a motor control part on said power panel to receive the move

command from the numerical control part and to generate a control signal which is provided to said plurality of motor amplifiers to cause the plurality of motor amplifiers to drive corresponding ones of said plurality of motors based on the control signal, said numerical control part and said motor control part being connected by a serial communication line.

Therefore, it is submitted that claim 8 patentably distinguishes over the prior art.

Summary

It is submitted that none of the references, either taken alone or in combination, teach the present claimed invention, Thus, claims 1-8 are deemed to be in a condition suitable for allowance. Reconsideration of the claims and an early notice of allowance are earnestly solicited.

Respectfully submitted,

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AMENDMENTS TO THE DRAWINGS:

In the Office Action at item 1, the Examiner stated that Figures 2 and 3 should be designated as Prior Art. In order to overcome these objections, replacement figures are submitted herewith with Figures 2 and 3 designated as Prior Art.

Please add new Figures 4 and 5.

Replacement drawings for Figures 1-5 are attached.

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